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ABSTRACT

This study used the Observation Schedule and Record 5V (OSCAR 5V) to describe and compare the teaching behaviors of second- and fifth-grade mathematics teachers. The sample included seven second-grade and nine fifth-grade teachers from three elementary schools in a medium sized city. Pupils in the participating teachers' classes were from middle class homes. Results indicated that overall mathematics teaching in the elementary school is very direct and teacher dominated. Direct behaviors constituted 56 percent of the behaviors of the second-grade teachers and 46 percent of the fifth-grade teachers. Describing was the most common teacher verbal behavior. Soliciting behaviors accounted for 33 percent of the second-grade behaviors and 26 percent of the fifth-grade behaviors. Results of analysis of variance showed several significant differences between grade levels. Fifth-grade pupils asked more substantive questions, and fifth-grade teachers reacted to pupils' responses by approval more than did second-grade teachers. Also, second-grade teachers had a higher teacher talk/total talk ratio. A comparison of results with those of a similar study in the eighth and eleventh grades indicated that the proportion of direct teaching behaviors is very stable across grade levels. (RT)

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Verbal Teaching Behaviors of Teachers of
Mathematics in Second and Fifth Grades¹

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Improvement in the teaching of mathematics is a persisting concern. During the past decade, most efforts to effect improvement in this field have been concentrated on curriculum development and updating of teachers' competence and understanding of mathematics. That such programs, necessary as they are, are not sufficient is attested by research reported by Sloan and Pate (1966). They noted some important changes in teaching behavior between elementary teachers who participated in a summer modern mathematics institute and teachers who did not participate in such a program. They concluded that efforts to improve mathematics teaching should include specific attention to teaching as well as to mathematics. Yet, question of how teachers "should" teach mathematics in the elementary school, as Medley (1967) has suggested in general, cannot logically be made until data is available on how teachers actually behave in the classroom teaching of mathematics.

Information about the teaching of mathematics, that is, the behaviors of classroom teachers as they teach mathematics, is not abundant. Wright's

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(1959) study seems not to have been followed up systematically and most research has been at the secondary level. Several investigators have used Flanders' Interaction Analysis in studies of the teaching of mathematics. Amidon and Flanders (1960) found that eighth grade geometry students whose teachers' styles were "indirect" achieved higher than did students whose teachers had a "direct" style. Lamanna (1968), on the other hand, noted that average sixth grade pupils achieved higher computation skills whose teachers were direct although pupils of above average ability increased their computation skills more with indirect teachers.

Additionally, Furst and Amidon (1962) reported that teachers in grades three to five talked more while teaching mathematics than they did in teaching reading and social studies. Grade three teachers were found to use lecture primarily in mathematics and social studies lessons and to give more criticism and directions in mathematics and reading lessons. They also noted that teachers in grades four and five asked many questions while teaching mathematics, although the kinds of question were not differentiated. Extended direct influence of teachers at all grade levels in mathematics was noted higher than in either reading or social studies. Goebel (1966) noted that fourth grade teachers of mathematics manifest percentages of total classroom talk, total teacher talk, and teacher directive talk above the average reported by Flanders (1965). Eighth and eleventh grade mathematics and social studies teachers have been found to differ little in their verbal teaching behaviors (Kysilka, 1969).

In view of the scarcity of documentation of elementary school teachers' behavior in teaching mathematics, additional research evidence

clearly is needed. This study, consequently, was designed to provide some information useful in extending the description of elementary school mathematics teaching.

Procedure

Seven second-grade teachers and nine fifth-grade teachers from three elementary schools in a medium sized city (population 250,000) participated in this study. The median age of these teachers was in the forties. All teachers were professionally certified and held bachelors degrees and eight held masters degrees. None of the teachers had degree majors or minors in mathematics. Teaching experience ranged from 1.5-36 years with a median of 16. Prior to observing in their classes, teachers were given an explanation of the study and assured that evaluations of teaching were neither possible with the observation instrument nor desired in this investigation.

Pupils in the participating teachers' classes were judged from middle to upper-middle class homes and were almost all anglo-Americans. The median IQ of the second grade pupils was 109; the median IQ of the fifth graders was 115.

Data were collected using the Observation Schedule and Record 5V (OSCAR 5V) (Medley and others, 1968). This 18 category instrument was designed to record sequentially verbal classroom behaviors, principally teachers' verbal behaviors. Two observers were trained to use the OSCAR 5V over a four-week period. Following training, the reliability (Scott, 1955) of their observations was .77 and .86.

Three twenty-minute observations were made of the mathematics class of each participating teacher. Observations were made from the beginning of the lesson. Data collection was completed during late April and early May, 1969.

Obtained data were subjected to analyses of variance. These analyses were performed employing the program ANOVAR-V (Veldman, 1967) on the CDC 6600 computer at The University of Texas at Austin.

Results

Results of the analyses of the twenty-one OScAR 5V category scores are displayed as Table 1. Only four contrasts were statistically significant. Fifth-grade pupils asked more substantive questions and responded directly to another pupil or indirectly to the teacher more than did second-grade pupils. Fifth-grade teachers let more pupil responses pass without evaluation and, also, reacted to pupils' responses by approval more than did second-grade teachers.

Table 2 shows the analyses of the seven ratio scores derived from combinations of the OScAR 5V category scores. Three of the seven contrasts were statistically significant. Second-grade teachers had a higher Teacher talk/ Total talk ratio and a lower Pupil initiated talk/ Teacher talk ratio than did fifth-grade teachers. Second-grade teachers also had a higher Soliciting/Informing ratio.

Five of the seven statistically significant differences obtained were $p < .05$. This number of significant differences (five of 29) could not have been observed by chance (Sakoda, Cohen, and Beall, 1954).

Discussion

On the basis of these findings, some descriptions may be stated about the teaching of mathematics in the elementary school. These statements surely are tentative and inconclusive, but may serve as a basis for further elaboration.

Teachers at primary and intermediate levels seem to behave very similarly while teaching mathematics. This conclusion is consistent with Kean's (1968) findings of great similarity in the oral language structure used by second- and fifth-grade teachers. Differences in their teaching behaviors are suggestive, nevertheless, that teachers at these two levels do differentiate, albeit little, their practices as a function of the educational maturity of the pupils, the complexity of the mathematics being taught, or some unknown combination of these factors. Perhaps, simply, there is, and should be, greater similarity than differences in teaching mathematics at these levels. Such conclusions, if substantiated by additional study, should yield productive implications for teacher education and curriculum development.

Overall, mathematics teaching in the elementary school seems highly direct and teacher dominated. Direct teaching behaviors (informing, describing, directing, rejecting rebuking-criticizing, and desisting) constituted 56% of the behaviors of the second-grade teachers and 46% of the behaviors of the fifth-grade teachers. Only 14% of the verbal behaviors at the second-grade and 19% at the fifth-grade were pupil initiated.

As determined by this study, describing was the most common teacher verbal behavior in the teaching of elementary school mathematics. Some 21% of the events in the second grade and 16% in the fifth were classified as describing. Directing behaviors comprised 20% of the second-grade behaviors and 14% of the fifth. Informing events comprised 12% at the second-grade level and 13% at the fifth.

Soliciting behaviors (PBST, CVG, DVG, EL1, and EL2) accounted for 33% of the second-grade behaviors and 26% of the fifth-grade behaviors. Divergent questions were almost non-existent in the elementary school mathematics lessons observed in this study.

These results are especially interesting when compared to Kysilka's (1969) study of eighth- and eleventh-grade mathematics teaching. She found that 25% of the behaviors at the eighth-grade level were informing, 10% were describing, 8% were directing, and 20% were soliciting. Of the behaviors in the eleventh grade, 34% were informing, 8% describing, 5% directing, and 17% soliciting. Pupils initiated 12% of the eighth-grade behaviors and 11% of the eleventh. Direct teaching behaviors constituted 44% of the behaviors at grade eight and 49% at grade eleven.

Apparently, mathematics teaching at higher grade levels progressively stresses information giving and decreases emphasis on describing, directing, and soliciting behaviors. Even so, the proportion of direct teaching behaviors appears rather stable from second- to eleventh-grades.

These conclusions are advanced cautiously. The sample of elementary teachers was not large; further, the population of pupils taught, and the

preparation of these teachers permit only limited views. The descriptions are restricted, also, by the language of the analytic instrument used. Some important dimensions of verbal teaching behaviors, such as the number of pupils participating in the discussion and the cognitive level of the questioning (e.g., application, evaluation), are missed by the OScAR 5V.

Additional serious study of elementary school mathematics teaching is needed. Teaching at all grade levels and in schools serving all types of pupils and using different mathematics curricula should provide very useful information. Too, records are needed of teachers at work with entire classes, small groups, and tutoring individual pupils. Such studies will add substantially to constructing an accurate description of the teaching of mathematics.

TABLE 1
Summary of Analyses of Variance
of OSCAR 5V Category Means

OSCAR 5V Categories	Mean Number of Observed Behaviors		F	p
	Second Grade Teachers	Fifth Grade Teachers		
Pupil Non Substantive	15.43	23.22	1.225	.287
Pupil Question	1.86	9.33	3.220	.091*
Pupil Statement	39.00	49.33	1.118	.309
Pupil Response	1.00	4.56	5.352	.035**
Problem Structuring				
Statement	55.71	35.56	2.342	.145
Convergent Question	48.43	37.67	1.105	.312
Elaborating 1 Question	22.00	31.44	.772	.602
Elaborating 2 Question	10.29	8.78	.150	.705
Divergent Question	0.00	.11	.766	.600
No Evaluation	28.14	44.89	4.471	.051*
Considering-Supporting	3.14	2.67	.090	.765
Informing	49.00	55.67	.235	.640
Approval	25.29	40.56	5.247	.036**
Describing	84.57	73.44	.295	.601
Accepting	51.00	43.22	.558	.527
Directing	82.86	59.78	2.909	.107
Rejecting	6.86	7.33	.017	.893
Rebuking-Criticizing	8.14	5.33	1.348	.264
Desisting	.86	.89	.001	.969
Procedural, Neutral-				
Non-Substantive	10.71	17.56	.807	.612
Procedural Positive	9.71	9.44	.003	.957
TOTAL	412.43	443.89	.577	.534

*Significant at the .10 level

**Significant at the .05 level

TABLE 2

Summary of Analyses of Variance of OSCAR 5V
Derived Ratio Scores

Ratios	Mean		F	p
	Second Grade Teachers	Fifth Grade Teachers		
Teacher talk / Total	.85	.76	6.411	.023*
Soliciting / Informing	2.06	1.28	4.909	.042*
Pupil talk / Teacher talk	.13	.21	4.725	.045*
Divergent / Convergent	0.00	.00	.766	.600
Elaborating 1/ Elaborating 2	1.48	.36	2.259	.152
Non-substantive / Total	.20	.18	.774	.602
Indirect / Direct	.56	.54	.038	.84

*Significant at the .05 level

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